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Indian Standard

AUTOMOTIVE VEHICLES — INSTRUMENT SYSTEMS — TEMPERATURE GAUGES — ELECTRICAL TYPE — SPECIFICATION

UDC 629·113·056·7 : 531·787

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

January 1993

Price Group 2

Automotive Instruments Sectional Committee, TED 10

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Instruments Sectional Committee had been approved by the Transport Engineering Division Council.

Electrical type temperature gauges are used for indicating the temperature of the lubricating oil or cooling water.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — INSTRUMENT SYSTEMS — TEMPERATURE GAUGES — ELECTRICAL TYPE — SPECIFICATION

1 SCOPE

This standard specifies the requirements for electrically operated temperature gauges used to indicate temperatures of cooling water or lubricating oil of automotive engines.

2 REFERENCES

The following Indian Standards are necessary adjuncts to this standard:

IS No.	*Title*
101 (Part 6/ Sec 1) : 1988	Method of sampling and test for paints, varnishes and related products: Part 6 Durability tests, Sec 1 Resistance to humidity under conditions of condensation (*third revision*)
2500 (Part 1) : 1973	Sampling inspection tables: Part 1 Inspection by attributes and by count of defect (*first revision*)
9000 (Part 3/ Sec 3) : 1977	Basic environmental testing procedures for electronic and electrical items: Part 3 Dry heat test, Sec 3 Dry heat test for non-heat dissipating items with sudden change of temperature
9000 (Part 5/ Sec 2) : 1981	Basic environmental testing procedures for electronic and electrical items: Part 5 Damp heat (cyclic) test, Sec 2 12+12 h cycle
9000 (Part 7/ Sec 2) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Sec 2 Bump
9000 (Part 7/ Sec 3) : 1979	Basic environmental testing procedures for electronic and electrical items: Part 7 Impact test, Sec 3 Drop and topple
9000 (Part 12) : 1981	Basic environmental testing procedures for electronic and electrical items: Part 12 Dust test
9000 (Part 14/ Sec 2) : 1988	Basic environmental testing procedures for electronic and electrical items: Part 14 Test N : Change of temperature, Sec 2 Test Nb : Change of temperature (temperature cycling) with specified rate of change – One chamber method
9000 (Part 16) : 1983	Basic environmental testing procedures for electronic and electrical items: Part 16 Driving rain test
10250 : 1981	Severities for environmental tests for automotive electrical equipment
11086 : 1984	Speedometers and odometer systems for automotive applications

3 TYPES AND CLASSES

Class 1	Coil type	Variable resistance type sendor unit
Class 2	Bimetal type	Variable resistance type sendor unit with voltage regulator and meter attachment

4 GENERAL REQUIREMENTS

4.1 The gauges shall comprise an integrated (unitized) sendor receiver units (*see* Fig. 1). Class 2 type shall include a voltage regulator.

4.2 The graduation shall be in degrees celsius. Points of lowest, middle and highest shall be indicated in the graduations. Typical dimensions may be specified. Arrangements for illumination and details of tubing shall be agreed between manufacturer and purchaser.

4.3 The plated and exposed areas shall be free from uneven plating, any significant flaws or any other injurious defects.

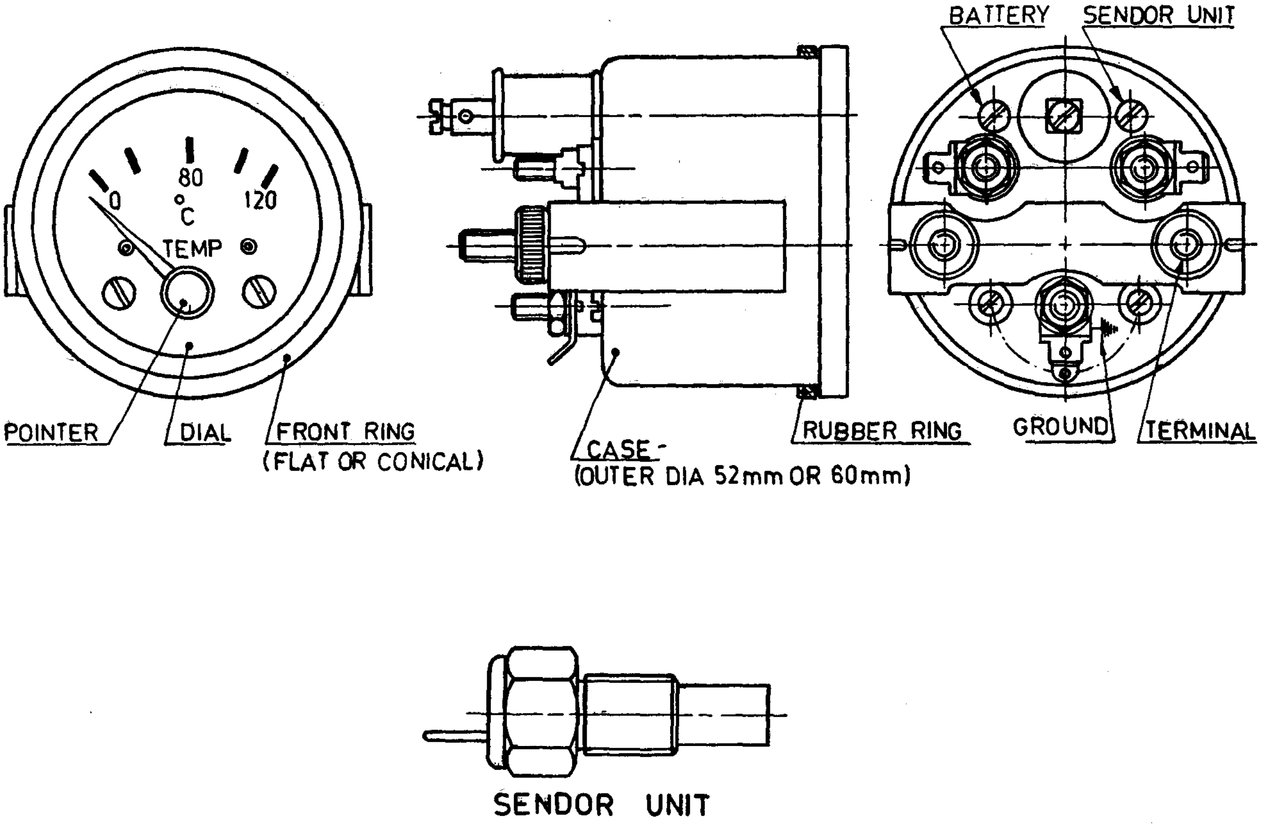

FIG. 1 ELECTRICAL TEMPERATURE GAUGE

4.4 The painted surface shall be uniform and free from lumps or any other irregularities.

5 SAMPLING

Unless otherwise agreed upon, the sampling plan shall be in accordance with IS 2500 (Part 1) : 1973.

6 TESTS

6.1 Test Conditions

The conditions for indicators shall be as follows:

a) Temperature and humidity at the test place shall be kept constant, in the specified error tests, the temperature shall be 25 ± 5°C.

b) Mounting condition shall be determined on the kind of vehicles.

c) Thermometer with an accuracy of ±0 5°C shall be used for the temperature measurement.

d) Test voltage shall be as shown in Table 1.

e) In the indication error test, slight vibration to the receiver unit or tapping of the unit to be done to remove influence of any frictional resistance.

Table 1 Test Voltages

Nominal Voltage	Performance Test Voltage in Volts	Endurance Test Voltage in Volts
6	6·5	7 ± 0·5
12	13·5	14 ± 0·5
24	27·0	28 ± 1·0

6.1.1 *Test Performance*

The gauge shall be mounted on the same position as it is in the vehicle and tested over its last two third of the range. Site readings are taken in both up and down the scale.

6.2 Indication Error Test

Indication error of gauges shall be as shown in Table 2.

Table 2 Errors of Gauges

(*Clause* 6.2)

Receiver Unit	Sendor Unit
Indication error of each class of indicator shall be at the following percentage of difference between a) the highest graduation temperature and lowest graduation temperature b) for the high graduation temperature and middle graduation temperature Class 1 = ± 5% Class 2 = ± 5%	Indication error of each class of indicator shall be at the following percentage of difference between a) the highest graduation temperature and lowest graduation temperature b) for high graduation temperature and middle graduation temperature Class 1 = ± 5% Class 2 = ± 5%

NOTES

1 When a voltage regulator is provided for the meter, its error shall be included in the receiver unit.

2 The high graduation temperature means 100°C, as a rule, in case of water thermometers. In case of oil thermometer, however, it means a point between 100°C and the highest graduation temperature.

3 In case of water thermometers the middle graduation temperature means one point between 70 to 90°C. In case of oil thermometers, it means a point between 80 to 100°C.

6.3 Delay of Indication

When the sendor unit of the gauge is placed in a warm solution at about 75°C, for indication of the highest graduation temperature, the pointer shall indicate the temperature higher than 90 percent of the highest graduation temperature within two seconds.

6.4 High Voltage Test

6.4.1 The parts are installed in regular service condition. The voltage is supplied at 60°C so as to increase stepwise, from 14 V/28 V by one volt at a time, allowing to remain for two hours at each step.

6.4.2 There shall be no failure (fracture) of parts until 17 V/32 V is indicated.

6.5 Heating and Rapid Cooling

When the sendor unit of the gauge is kept in a liquid solution tank at about 100°C for five minutes and then immediately cooled in the water at normal temperature for five minutes, and this process is repeated three times, no abnormalities shall be observed. The permissible variation of the observed values from the initial values shall be ±2 percent.

6.6 Insulation Resistance

When the insulation resistance is measured between the receiver unit terminal and outer case at normal temperature with a 500 V insulation resistance meter, it shall be more than one megohm. This is applicable for insulated type meter only.

6.7 Damp Heat (Cyclic) Test

6.7.1 The damp heat (cyclic) test carried out according to IS 9000 (Part 5/Sec 2) : 1981 shall not be followed by exposure to cold. The number of conditioning cycles shall be two.

6.7.2 After the test the temperature gauge shall satisfy the tolerance ±2·5 percent of the full range.

6.8 Temperature Resistance

6.8.1 When the indicator is tested as specified in IS 9000 (Part 14/Sec 2) : 1988, each part shall be free from any abnormalities and shall comply with **6.2, 6.3, 6.5** and **6.6**. The permissible variation between the observed value from the initial value shall be ±2 percent.

6.8.2 *Low Temperature Test*

When cooled down to 0°C for 48 h and brought back to ambient temperature the dimensional and indication error of the systems shall not vary by more than ±2 percent of the initial values.

6.9 Vibration Resistance

When the gauge and the receiver unit is mounted on a vibration tester to produce a simple harmonic motion, it shall be vibrated through a frequency range of 10-55-10 Hz in one minute. With continuously varying frequencies the vibration shall be applied for not less than one hour in each of the three major axis as per IS 11086 : 1984. When the sendor unit is vibrated as specified in IS 11086 : 1984 and operated at a temperature of about 80 percent of the highest graduation, the vibration of the indication from that before the test shall be

±3 percent to ±8 percent of the difference between the highest and lowest graduation temperature. No abnormalities shall be observed in other parts. The receiver unit and sendor unit shall be tested separately.

6.10 Endurance Test

The sendor unit of the gauge is warmed from the lowest graduation temperature to 80 percent of the highest graduation temperature and then cooled to the lowest graduation temperature. The process is repeated 5 000 times at the rate of 4 min/cycle. The variation from that before the test shall be less than 7 percent of the difference between the highest graduation temperatures. No abnormalities shall be observed in other parts.

6.11 Water Spray Test

When the gauge is exposed to direct water spray for 30 minutes and visually checked, no significant blur shall be observed on the glass inside of the receiver unit. If a lighting arrangement or ventilation hole is provided, only the front glass shall be tested. The permissible variation between the observed values from the initial value shall be ± 2 percent. Any ingress of water shall be checked as specified in IS 9000 (Part 16) : 1983.

6.12 Salt Spray Test

After carrying out the test as given in Appendix A of IS 10250 : 1982 the gauge shall be subjected to the high voltage (flash) test and the performance test. The permissible variation of the observed values from the initial values shall be ± 2 percent. The visual appearance of the gauge after the test shall not prejudice assessment of results.

6.13 Dust Test

After carrying out the test specified in IS : 9000 (Part 12) : 1981 the test is conducted under normal supply voltage range and the characteristics of the equipment are recorded. The permissible variation of the observed values from the initial values shall be ±2 percent.

6.14 Dry Heat Test

The test is to be carried out as per IS 9000 (Part 3/Sec 3) : 1977 with a gradual change of temperature under the following conditions:

Temperature	70 ± 3°C
Duration of exposure	4 hours

After the test the gauge shall be cooled to the ambient temperature of 25 ± 5°C and visually examined for any defects. The gauge shall also be capable of satisfactory performance after the test.

6.15 Drop Test

The gauge shall be tested as per IS 9000 (Part 7/Sec 3) : 1979. The permissible variation of the observed values from the initial values after the test shall be ±2 percent.

6.16 Bump Test

After testing as per IS 9000 (Part 7/Sec 2) : 1979 the permissible variation between the observed and the initial values shall not exceed ±2 percent.

6.17 Visual Tests (for Painting)

The paint film not exposed directly to rain or wind shall be tested by immersing in a liquid tank kept at a temperature of 40°C for one hour. The film is then allowed to dry for one hour. The painted surface edges of the indicator and the case shall be free from peeling of paint softening, flooding or discolouration. This condition, however, shall not be applicable for resin bases.

The paint film exposed directly to wind or rain shall comply with class 2 or class 3 of water resistance and class 2 corrosion resistance of IS 101 (Part 6/Sec 1) : 1988.

6.18 Plating

Plating of surface edges shall be in accordance with Table 3. The total thickness of chromium plating or resin base shall be more than 10 microns.

Table 3 Plating Requirements for Indicator and Gauge Case

(For Surface Exposed/Not Exposed Directly to Wind or Rain)

	Base	Thickness	
Nickel	Iron Brass	10 microns 5 microns	
Chromium	Iron Brass	10 microns 5 microns	
Zinc	Iron	5 microns 8 microns	 (exposed directly)

7 MARKING

The instrument shall be marked with symbol for the gauge, indication of the source of manufacture, serial number, date of manufacture, trade/brand name, printed preferably on the dial. Any other marking as agreed to between the suppliers and the purchasers may also be printed on the dial.

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